



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,900	02/10/2006	Hidetaka Kojima	3273-0219PUS1	2123

2292 7590 04/02/2007  
BIRCH STEWART KOLASCH & BIRCH  
PO BOX 747  
FALLS CHURCH, VA 22040-0747

EXAMINER
LAO, MARIALOUISA

ART UNIT	PAPER NUMBER
1621	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/02/2007	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/02/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

## Office Action Summary

**Application No.**

10/567,900

**Applicant(s)**

KOJIMA ET AL.

**Examiner**

MLouisa Lao, Ph.D.

**Art Unit**

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 2/10/06.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

2. **Claim 4 is rejected** under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In lines 4-5 of claim 4, applicants recite “*3.1 percent by weight or more*”, which contravenes claim 1 line 10, where applicants recite the limits of “*2 percent by weight or more*”. It is suggested that the limitations of the dependent claim be correlated to the recitation of claim 1.

3. **Claim 6 is rejected** under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In line 2 continuing to line 3, applicants recite “*15 mol/L.hr*”, which contravenes claim 1 line 7, where the applicants recite the minimum at “*11 mol/L.hr*”. It is suggested that the limitations of the dependent claim be correlated to the recitation of claim 1.

4. **Claim 8 is rejected** under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In line 6 of claim 8, the applicants may have intended to recite “residual acetic acid” in lieu of “recovering acetic acid”. In line 9 of claim 8, applicants may have intended to recite “residual acetic acid” in lieu of “residual process mixture”.

Art Unit: 1621

5. **Claim 8 is rejected** under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 8 recites the limitation "residual process mixture" in line 9. There is insufficient antecedent basis for this limitation in the claim. The applicants may have intended to recite "residual acetic acid".

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

Art Unit: 1621

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. **Claims 1-7 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Miura et al. (EP0687662, EP'662), and further in view of Ditzel et al. (US5939585, US'585).

11. The instant claims are drawn to a method for producing acetic acid, comprising, *inter alia*, continuously reacting methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt, methyl iodide, methyl acetate, and water; with the following method characteristics, which are, *inter alia*, a production rate of 11 mol/L.hr or more; the acetaldehyde content kept to 500 ppm or less, carbon monoxide partial pressure of 1.05 MPa or more, methyl acetate of reaction mixture of 2 percent by weight or more, production rate of acetaldehyde to production rate of acetic acid at 1/1500 or less, hydrogen partial pressure, *inter alia*, at 100kPa or less, water content of the reaction mixture of 3% by weight or less.

12. EP'662 recites in page 20 claims 1-2, a process of producing a high purity acetic acid, comprising continuously reacting methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt, and methyl iodide, wherein the reaction is carried out while maintaining an acetaldehyde concentration in the reaction liquid at 400 ppm or lower. In lines 37-39, EP'662 states that the water content is preferably 1 to 5 weight %. In lines 45-46, EP'662 states the partial pressure of carbon monoxide is preferably 4 to 5 atm.

13. EP'662 is silent on the partial pressure of hydrogen, the water content and methyl acetate content of the reaction mixture and the production rate of acetic acid.

14. US'585 is relied upon to show in column 28 lines 18-29 and lines 41-43 for a process for the production of a carboxylic acid having (n+1) carbon atoms by the carbonylation of an alkyl

Art Unit: 1621

alcohol with carbon monoxide in the presence of a rhodium catalyst, a promoter, an alkyl halide, and from 0.1% up through 7.0% by weight of water; wherein the partial pressure of the carbon monoxide is from 1 to less than 5 bar. In column 2 lines 53-59, US`585 states that it is preferred that the level of ester concentration is inversely proportional to the level of water in a process for preparation of acetic acid, where for example, at a water concentration of 5.7% by weight, the methyl acetate concentration is preferably greater than 1.2% by weight. In Example 21 column 19 line 66, US`585 states that the production rate is 10.70 mol/L.hr. while in column 4, lines 20-35, US`585 discusses the partial pressure ratio of carbon monoxide to hydrogen, where it is set at 10:1. US`585 discloses in column 4 lines 34-58 that when the partial pressure of carbon monoxide is relatively low, like 5 bar and with low water levels, less than 14% and high ester concentrations enables the catalyst system to render the carbonylation reaction to proceed at a faster rate.

15. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to reconcile the use of the teachings of partial pressure of hydrogen, the water level and the methyl acetate level of the reaction mixture of US`585 in the method of EP`662 since the process of US`585 is a carbonylation process for the production of a carboxylic acid entailing the use of carbon monoxide and an alkyl alcohol, in the presence of a rhodium catalyst, promoter and alkyl halide; whereby similarly, EP`662 is drawn to a carbonylation process of acetic acid, which includes the reaction of carbon monoxide with methanol in the presence of a rhodium catalyst, an iodide salt, and methyl iodide. The carbonylation process of US`585 is equivalent to EP`662, and similarly, acetic acid is a typical carboxylic acid effectuated from the reaction of carbon monoxide with methanol, where the latter is a typical alkyl alcohol



Art Unit: 1621

and the production rate in US`585 would have been equivalent to that achieved for EP`662; since additionally, EP`662 also solved the problem of 400ppm less carbonyl impurities, like acetaldehyde.

16. One having ordinary skill in the art would have been motivated to combine the teachings of US`585 in EP`662, since US`585 has shown the advantage of relatively low partial pressure of carbon monoxide (i.e. with 10:1 to the partial pressure of hydrogen), like 5 bar or less with low levels of water like 3% or less, high concentrations of methyl acetate, like 3% or more to make a catalyst system (rhodium with alkyl iodide) result to a faster and more efficacious carbonylation process for the formation of acetic acid; whereby the artisan in adapting optimal methods and parameters that have been found to be effective in his art, would then expect a reasonable degree of success.

17. Thus, the teachings of EP`662 and US`585 fairly suggests that the instant claims, as recited are *prima facie* obvious.

18. **Claims 8-10 are rejected** under 35 U.S.C. 103(a) as being unpatentable over unpatentable over Miura et al. (EP0687662, EP`662), and further in view of Cheung et al. (US7005541, US`541).

19. The instant claims are drawn to a method for producing acetic acid, comprising, *inter alia*, continuously reacting methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt, methyl iodide, methyl acetate, and water; with the following method characteristics, which are, *inter alia*, a production rate of 11 mol/L.hr or more; the acetaldehyde content kept to 500 ppm or less, carbon monoxide partial pressure of 1.05 MPa or more, methyl acetate of reaction mixture of 2 percent by weight or more, production rate of acetaldehyde to

Art Unit: 1621

production rate of acetic acid at 1/1500 or less, hydrogen partial pressure at 100kPa or less, water content of the reaction mixture of 3% by weight or less; and further comprising a purification process. The said purification step comprises the separation of the target acetic acid compound from the reaction by-products, treating the acetic acid with a silver- or mercury-exchanged *[sic]* resin, as well as the recovery and recycling of catalyst system and reactants reusable to augment virgin materials.

20. EP'662 recites in page 20 claims 1-2, a process of producing a high purity acetic acid, comprising continuously reacting methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt, and methyl iodide, wherein the reaction is carried out while maintaining an acetaldehyde concentration in the reaction liquid at 400 ppm or lower. In lines 37-39, EP'662 states that the water content is preferably 1 to 5 weight %. EP'662, in lines 45-46 page 4, states the partial pressure of carbon monoxide is preferably 4 to 5 atm. In lines 53-57 page 3, EP'662 discusses that the resulting reaction liquid of methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt and methyl iodide is *separated* from the low volatile phase containing the rhodium catalyst, *distilling* the volatile phase to obtain a product mixture containing acetic acid and the overhead containing methyl acetate and methyl iodide, and *recirculating* said overhead into the reactor, wherein the overhead contains acetaldehyde and iodide. In page 2 lines 49-51, EP'662 discusses that the *ion-exchange resin* for treating the acetic acid is the partially converted *silver* form of a macro-reticulated strong acid cation exchange resin.

21. EP'662 is silent on the components separated from acetic acid during the purification process.



Art Unit: 1621

22. US'541 in column 6 lines 1- 67 continuing to columns 7-8 lines 1 68 is relied upon to show that in the carbonylation reaction of acetic acid, the reaction mixture of methanol and carbon monoxide are continuously fed to a reactor in which desired partial pressure of carbon monoxide is maintained, the accumulation and level of impurities or PRC's (permanganate reducing components, like acetaldehyde) are kept to a minimum; whereby the reaction mixture is separated into product acetic acid and lighter components of reaction mixture, the latter containing mostly acetic acid and catalyst may be recycled back to the reactor. Vapors from the flasher are fed to a splitter, where overhead vapors are condensed and separated into light aqueous phase and a heavy organic phase. The light aqueous phase contains water, acetic acid, methanol, methyl iodide and methyl acetate and some PRC's. The heavy organic phase contains mainly methyl iodide and methyl acetate, which may be recycled as is or after further processing. The light aqueous phase is typically used as reflux and a portion recycled back to the reaction section, where typically a first distillation column serves to separate the fraction of a lighter overhead comprising acetaldehyde, methyl iodide and methyl acetate from the heavier fraction comprising acetic acid and water which is recycled to the purification section. In lines 41-68 column 7, US'541 delineates the steps and components thereto, comprising *volatile and low-volatile components separated by at least two distillation steps, the volatile component comprising acetic acid, water, methyl acetate and methyl iodide, and the low-volatile component comprising the catalyst system and the PRC's (carbonyl impurities)* by step-wise illustration of the figure therein inclusive of the *distillation columns* and reference to *further processing steps*.

23. It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to utilize the process steps of US'541 in EP'662 since the carbonylation

Art Unit: 1621

process of US`541 has the equivalent components of acetic acid, water, methyl acetate and methyl iodide, and catalyst system, inclusive of undesirable PRC's and other impurities.

24. One having ordinary skill in the art would have been motivated to do this since the carbonylation of US`541 for acetic acid shows the components are separated efficaciously with an increased STY (space time yield) with impurities kept to the minimum, which is an equivalent carbonylation process of EP`662 for the production of acetic acid and the artisan in optimizing his processes within the normal routine of adapting processes that work effectively, would expect a reasonable degree of success.

25. The combination of the teachings of EP`662 and US`541 are fairly suggestive of the *prima facie* obviousness of the instant claims, as recited.

### *Correspondence*

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MLouisa Lao, Ph.D. whose telephone number is 571-272-9930. The examiner can normally be reached on Mondays to Fridays from 8:30am to 5:00pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thurman Page, can be reached on 571-272-0602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

`mll 032212007  
MLouisa Lao, Ph.D.  
Examiner  
Art Unit 1621

THURMAN D. PAGE  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1600  
THURMAN PAGE  
SUPERVISORY PATENT EXAMINER  
TC1600 GAU 1621